

C l a i m s

1. Process for ignition of combustion of fuel in the combustion space (5) of an engine (2) by injecting into the combustion space (5) microwave radiation produced in a microwave source (7) outside of the combustion space, the injected microwave radiation being absorbed by the fuel distributed in the combustion space (5), and due to the energy delivery into the fuel which occurs due to absorption the combustion being ignited essentially at the same time, distributed over a large volume in the combustion space (5), preferably uniformly distributed in the entire combustion space (5).
2. Process as claimed in claim 1, wherein the microwave radiation is injected in the form of one or more microwave pulses of short time duration and high energy.
3. Process as claimed in claim 2, wherein the number of microwave pulses and/or their power and/or their pulse duration and/or their instant is controlled depending on the operating state of the engine (2) and the power demand on the engine (2).
4. Process as claimed in claim 2 or 3, wherein preferably 1 to 10 microwave pulses, especially 1 to 5 microwave pulses, are used, preferably with a power between 1 kW and 70 kW, a pulse duration between 1 ns and 2 ms, and a pulse spacing between 100 ns and 2 ms.
5. Process as claimed in one of claims 2 to 4, wherein for the ignition process several microwave pulses with preferably different power and/or pulse duration are injected and guarantee leveling of the temperature increase of the fuel distributed in the combustion space up to the ignition temperature by gradual delivery of energy.
6. Process as claimed in one of claims 1 to 5, wherein the formation of a plasma in the combustion space (5) is prevented by the choice of the time interval of injection of microwave radiation, its power and optionally the pulse duration and pulse spacing.

7. Device (1) for igniting the combustion of fuel in the combustion space (5) of an engine (2), the device (1) having a microwave source (7) located outside of the combustion space (5) and a microwave window (13) connected to the microwave source (7), and the microwave radiation can be injected into the combustion space (5) by way of the microwave window (13) so that the injected microwave radiation can be absorbed by the fuel distributed in the combustion space (5), and due to the energy delivery into the fuel which occurs due to absorption combustion can be ignited essentially simultaneously, distributed over a large volume in the combustion space (5), preferably uniformly distributed in the entire combustion space (5).
8. Device (1) as claimed in claim 7, wherein the microwave source (7) is supplied by an electric power supply source (6) which delivers electrical pulses which can be converted into microwave pulses by the microwave source (7).
9. Device (1) as claimed in claim 7 or 8, wherein between the microwave source (7) and the microwave window (13), preferably over the course of the microwave line (8, 12), there is a coupling means (10) which transmits the microwaves sent from the microwave source (7) to the microwave window (13), but which does not transmit the microwaves reflected by the combustion space (5) back into the microwave source (7).
10. Device (1) as claimed in claim 9, wherein the coupling means (10) has a triple port, especially a circulator (10) with a microwave source (7) connected to its first port, a microwave window (13) connected to its second port, and a preferably passive microwave consumer (19) connected to its third port.
11. Device as claimed in one of claims 7 to 10, wherein the microwave window (13) has a ceramic material or consists completely of a ceramic material.

12. Device as claimed in one of claims 7 to 11, wherein the microwave source (7) is connected to the microwave window (13) by a preferably flexible microwave line (8, 12).
13. Engine (2) with a device (1) as claimed in one of claims 7 to 12 for ignition of the combustion of fuel in the combustion space (5) of an engine (2).
14. Engine (2) as claimed in claim 13, wherein it is an Otto engine, a Wankel engine, SIDI (spark ignition direct injection) engine or diesel engine and wherein a fuel-air mixture is ignited in the combustion space (5).